

# UNITED STATES PATENT APPLICATION

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**Invention:** COMBINATION DENTAL MIRROR AND MEASURING GAUGE

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5                   **COMBINATION DENTAL MIRROR AND MEASUREMENT GAUGE**

CROSS-REFERENCE TO RELATED APPLICATIONS

                  The present application derives priority from U.S. Provisional Patent Application No.  
10   60/461,582 for "COMBINATION DENTAL MIRROR AND MEASURING GAUGE"; Filed:  
          April 8, 2003.

15                   BACKGROUND OF THE INVENTION

                  1. Field of the invention

                  The invention relates to dental instruments and, more particularly, to a dental mirror  
          having a handle end equipped with a measuring gauge particularly suited for measuring a length  
          of root canal file up to an attached stopper, thereby indicating the depth of penetration of a root  
20   canal.

                  2. Description of the Background

                  The standard dental mirror, magnified or plain, with a round 22-24 mm in diameter  
          circular mirror surface attached to a handle at an angle of approximately 45 degrees, is necessary  
25   in the practice of dentistry to indirectly view hard-to-see areas within a patient's mouth, during  
          examination or treatment. Such dental mirrors are essential during root canal therapy  
          (endodontic treatment) to view the treatment area.

5           Typically, by viewing into the occlusal prepared access cavity, the dentist uses a dental mirror and a dental explorer (pick) to locate and penetrate the root canal orifice opening. This is followed by the dentist placing a root canal file, into the opening and penetrating the canal only to its apical extent, the apical foramen, without perforating the apical foramen and entering the surrounding periapical tissue and bone. Perforation of the apical foramen exposes the patient to  
10 the possibility of pain, swelling and infection. The depth of penetration is measured and the file is removed. An accurate measurement is required to insure complete penetration to the apical extent of the root canal without perforation of the apical foramen.

          A typical and yet makeshift way of measuring the file penetration length is to place a rubber stop on the tip of the file with ends of the file and stopper flush, and to insert the file into  
15 the access cavity. The surface of the tooth urges the rubber stop backwards along the file as the file is inserted. Once the file is fully inserted, it is withdrawn and the distance traveled by the rubber stopper from the tip of the file is indicative of the depth to which the root canal is penetrated. Millimeter rulers are used to measure this depth of penetration.

          More sophisticated devices have been developed to help in measuring penetration. For  
20 example, in effort to make the file and the millimeter ruler easier to manipulate, a millimeter ruler which attaches to the finger by a ring has been developed. Also, the millimeter ruler has been integrated with the dental mirror, in an effort to reduce the number of separate instruments, which must be handled. The RMH Integrator® by Moyco Union Broach™ Company incorporates a millimeter ruler and the mirror. Specifically, the millimeter ruler is fixed in  
25 perpendicular relation to the shaft of the mirror instrument. In order to use this instrument, the

5 millimeter ruler portion is aligned with the portion of the file which has not penetrated the root canal and the measure of its length is deducted from the overall length of the file to determine the length of the patient's root canal. Unfortunately, when the instrument is being used as a dental mirror, the perpendicular millimeter ruler portion is an awkward extension.

A more simplified approach has also been used. Millimeter rule markings have been  
10 stamped or inscribed on the handle of the dental mirror. This type of measuring instrument suffers from the fact that the mirror handles are typically rounded so they may be easily held at any angle. The measurement must be made by aligning the file with the rounded mirror handle and reading the markings, which correspond with the end of the file and the edge of the rubber stop. The rounded shape of the handle and the light reflecting from the surface, which is usually  
15 metal, make it difficult to obtain an accurate reading.

Therefore, there is a need for a multi-purpose tool for use during endodontic treatment that integrates a conventional dental mirror and a device for measuring the depth of penetration of a root canal file into the root canal. It would be advantageous over the prior art to provide a such a single multi-purpose instrument that can easily and efficiently be used as a dental mirror  
20 and also be used to accurately measure the depth of penetration of the root canal. It would be advantageous over the prior art if this all-in-one instrument did not require additional extensions, over the configuration of a standard dental mirror, which might effect positioning of the instrument within the patient's mouth. In addition it would be advantageous over the prior art if the file could be easily stabilized by the instrument in order to obtain an accurate measurement  
25 and if the measurement markings upon the instrument were clearly visible.

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### SUMMARY OF THE INVENTION

It is an object of the present invention to provide a multi-purpose dental tool that unobtrusively integrates a streamlined measuring device and a conventional dental mirror.

10 It is another object to provide such a tool that maybe used as a conventional dental mirror.

Another object of the present invention is to provide such a tool with ruler markings which may be used to measure the depth to which a root canal file has penetrated a patient's root canal to the apical foramen, when using the file/rubber stopper procedures discussed above.

15 Another object of the present invention is to provide such ruler marking which may be used to measure the depth of root canal penetration without requiring arithmetic calculations to obtain the correct result.

It is another object to provide such a tool with ruler markings that can be easily read to obtain an accurate result.

20 Lastly, is an object of the present invention to provide a means of securing the root canal file to the tool of the present invention when measuring depth of penetration against the ruler markings in order to obtain an accurate measurement.

According to the stated objects, the present invention is a multi-purpose dental tool combining a dental mirror and measurement gauge. The tool includes a shaft, preferably rounded in cross-section. On one end of the shaft is mounted a dental mirror, preferably a front surface  
25 22-24 mm diameter circular mirror angled at approximately 45 degrees. The opposite end of the

5 shaft is defined by a flat end surface perpendicular to the length of the shaft and a semi-circular groove running along the side of the shaft for a distance of approximately thirty millimeters from the flat end. The groove is of a shape and size to receive and secure the end of a root canal file. Measuring lines in millimeters are marked along the length of the groove. In use, a root canal file with an attached rubber stopper (indicating the depth of the apical foramen) is placed within  
10 the groove such that the rubber stopper abuts the flat end of the shaft. The length of the file from the flat end of the shaft to its end point within the groove can easily be measured by observing the provided markings.

Alternatively, the flat end of the shaft may open into an internal channel, running lengthwise along the shaft for approximately 30 mm. At least a portion of the shaft is comprised  
15 of a transparent outer surface such that the internal channel is visible, with measuring lines marked along the length of the channel.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features, and advantages of the present invention will become more  
20 apparent from the following detailed description of the preferred embodiment and certain modifications thereof when taken together with the accompanying drawings in which:

FIG. 1 is a front perspective view of the combination dental mirror and measurement gauge of the present invention.

5           FIGs. 2 and 3 are sequential a perspective views of the combination dental mirror and measurement gauge as in FIG. 1, illustrating the method of measuring a conventional root canal file.

FIG. 4 is a perspective view of an alternative embodiment of the present invention, further illustrating the method of measuring a conventional root canal file.

10           FIG.s 5a and b illustrate a typical root canal file fitted with a stopper before and after insertion into the root canal, respectively.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring in combination to FIG.s 1-3, the present invention is multi-purpose dental tool  
15   2 integrating a conventional dental instrument of a type having an elongated handle (shaft), such as a standard dental mirror 6, and an accurate measuring device 10 integrated into the shaft 5.

While the multi-purpose tool 2 of the present invention is describe herein as a combination dental mirror 6 and measuring gauge 10, those skilled in the art will recognize that measuring gauge 10 described below can be integrated into any dental instrument having an elongated handle.

20           The multi-purpose tool 2 of the present invention as shown in FIG. 1 comprises a shaft 5, preferably cylindrical in shape, having a first end 20 and a second end 21. A dental mirror 6 is formed on the first end of the shaft 5. It is preferred that the dental mirror 6 include a front reflective surface, plain or magnified, type having a circular shape with a diameter of approximately 22-24 mm and that it be mounted so that the plane of the mirror surface is raised  
25   and forms an angle of (i.e. approximately 45 degrees) with the shaft 5. This configuration is

5 known as the contra angle style and provides easy viewing as well as serves to eliminate the collection of debris at the point of attachment between the mirror 6 and shaft 5.

The second end 21 of shaft 5 further comprises a flat surface 23 aligned along a plane perpendicular to the longitudinal axis of the shaft 5. In accordance with the present invention a measuring device 10 is incorporated into the second end 21 of the shaft 5. Opening onto the flat  
10 surface 23 is a channel, which in the illustrated embodiment is a straight groove 7 that extends along the length of the shaft 5 for a distance of approximately thirty millimeters. This 30 mm length is calculated to accommodate most conventional root canal files as described below with varying lengths. The groove 7 is preferably semi-circular in shape with a 1 mm diameter and .5 mm radius to conform to and receive a conventional root canal file 100, albeit the shape and  
15 diameter of the groove may vary depending upon the shape and size of root canal file 100 anticipated. The outer surface of the shaft 5 adjacent to the groove 7 is marked with measuring lines 8 spaced in millimeter (or other) increments. The measuring lines 8 can be applied to the surface of the shaft 5 in permanent ink media or inscribed, molded, or otherwise etched into the shaft 7 surface. The measuring lines 8 are preferably subdivided into major and minor intervals  
20 extending along the 30 mm gauge. For example, the measuring lines 8 may be marked with major intervals 8a (i.e. every 5 mm) that are either longer or broader or both than minor intervals 8b (i.e. every 1 mm). The major intervals 8a are also preferably labeled with numerals 8c to assist the user with reading a measurement. The measuring lines 8 are applied and labeled such that the measuring line occurring at a particular point denotes the accurate distance from the  
25 second end 21 of the shaft 5.



5           In an alternative embodiment (See FIG. 4), the multi-purpose tool 2 is formed with a central and preferably circular channel 70 opening into the second end 21 of shaft 5 with a 1 mm diameter opening at aperture 24 onto the flat end 23 and extending the length of the shaft 5 approximately 30 mm. Sections of the outer surface of the shaft 5 and of the channel 70 are configured to be transparent (i.e. window 26 of transparent plastic) so that the interior of the  
10   channel 70 is visible and the length of the file 100 inserted into the channel 70 may be measured.

Both above-described embodiments of the shaft 5 may be formed of materials that are autoclavable and chemiclavable for re-use. Suitable materials include fiberglass, plastic, ABS plastic, glass filled resin, stainless steel, nickel chrome steel, and polymers. However, a disposable tool 2 is also anticipated.

15           In use of the above-described embodiments, FIG.s 5a and b illustrate a typical root canal file 100 fitted with a stopper 101 before and after insertion into a root canal (not shown), respectively. A typical root canal file 100 is a long thin device having a body 105 (i.e. steel bar) with a pointed end 102 and a finger grip 103 at the other end. Root canal files 100 are available in a variety of lengths, including 21 mm, 25 mm, and 29 mm, as well as shapes (i.e. S-files, K-  
20   files, H-files, Reamers, etc.) As discussed in the "Description of the Background" section above, during root canal procedures a root canal file 100 is fitted with a rubber stopper 101 flush with is pointed end 102. In performing root canal therapy, the dental mirror 6 is used to view the insertion of the root canal file 100 into the root canal. As the file 100 enters the canal, the stopper 101 is pushed backwards along the file bar 105. Once the file 100 has penetrated the root  
25   canal to the apical foramen, the file is removed. The distance (l=106) that the stopper 102

5     traveled along the body 105 is equal to the depth of penetration to the apical foramen. The  
measuring device 10 of the present invention is designed particularly to measure this distance 1  
(106). To use the measuring device 10, an operator will slide the root canal file 100, pointed end  
102 first into groove 7 (as shown in FIG. 2) until bar 105 lies flat within the groove 7 and the  
stopper 101 abuts the flat end 23 of the shaft 5 (as shown in FIG. 3). Positioning the file 100  
10     within the groove 7 secures the file for accurate measuring. The operator will note the length of  
the file 100 within the groove 7 using the markings 8 (8a-c), and thus the depth of penetration of  
the root canal to the apical foramen. Thus, there is no need to handle a separate instrument or to  
adjust any part of the measuring device before the measurement can be taken.

Having now fully set forth the preferred embodiment and certain modifications of the  
15     concept underlying the present invention, various other embodiments as well as certain variations  
and modifications of the embodiments herein shown and described will obviously occur to those  
skilled in the art upon becoming familiar with said underlying concept. It is to be understood,  
therefore, that the invention may be practiced otherwise than as specifically set forth herein.